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VARIETIES OF HARD RED SPRING WHEAT



HARD RED SPRING WHEAT is grown principally in the north-central part of the United States, where the winters are too severe for the production of winter wheat. The States of North Dakota, Montana, South Dakota, and Minnesota lead in its production. About 12,000,000 acres of this class of wheat are grown annually in the United States, comprising more than one-fifth of the total wheat acreage during the last 10 years.

From hard red spring wheat is produced flour of high bread-making quality.

There are 23 recognized registered varieties of hard red spring wheat commercially grown in the United States. Some of these are known under different names. A few additional distinct varieties are sparingly grown.

Marquis is the leading variety. It was introduced in 1913 and since 1919 has been the most widely grown hard red spring wheat. It is high yielding and fairly early maturing and excels most of the other varieties in the quality of its flour.

The Preston (Velvet Chaff) variety yields slightly less than Marquis and is more susceptible to stem rust. The Red Fife and Power varieties are best adapted to northwestern North Dakota. Kota is rust resistant, and Ruby is early maturing. Both have been grown in eastern North Dakota, where stem rust is often an important factor.

Of the newer varieties recently developed, Ceres is the most promising. It has consistently out-yielded Marquis in North Dakota, is rust resistant, and is of high quality. Marquillo has strong straw, is rust resistant, and yields well in Minnesota. Hope is practically immune from rust and yields well in South Dakota under unfavorable conditions of rust or drought. Supreme and Reliance are high-yielding varieties under favorable, rust-free conditions in Montana. Reward has the best quality, but is not high yielding.

In general, Marquis is the most widely adapted variety of hard red spring wheat.

This bulletin is a revision of and supersedes Farmers' Bulletin 1281, The Hard Red Spring Wheats.

VARIETIES OF HARD RED SPRING WHEAT¹

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THE HARD RED SPRING CLASS OF WHEAT

WHEAT IS SEPARATED into five classes under the official grain standards of the United States. The first class is designated as hard red spring. About 22 per cent of the wheat acreage of the United States is of this class. The varieties which make up this important class of wheat are distinguished by having hard red kernels and are grown from spring sowing, chiefly in the north-central part of the United States. There are 23 registered varieties grown. Flour of high bread-making quality is manufactured from the principal hard red spring varieties.

WHERE HARD RED SPRING WHEATS ARE GROWN

The States leading in the growing of hard red spring wheat varieties are North Dakota, Montana, South Dakota, and Minnesota, in the order named. A considerable acreage is grown also in Iowa, Illinois, Wisconsin, Nebraska, Colorado, Wyoming, Idaho, Washington, and Oregon, and smaller quantities of but little commercial importance in six other States. A map of the United States showing the distribution of hard red spring wheat in 1924 is shown as Figure 1. Each dot on the map represents 2,000 acres of this class of wheat. The acreage sown in 1924, which was estimated to be 11,396,140 acres, was slightly smaller than that in a normal year.

¹ The information given in this bulletin is based upon (1) varietal experiments conducted by the Office of Cereal Crops and Diseases, of the Bureau of Plant Industry, U. S. Department of Agriculture, and the State agricultural experiment stations, either independently or in cooperation; (2) classification studies of all American wheat varieties; (3) a survey of the wheat varieties of the United States grown in 1924 in cooperation with the Bureau of Agricultural Economics, based upon about 6,500 returns from questionnaires sent to crop correspondents; (4) several years of personal observation of the wheat fields in the States where these varieties are grown; and (5) milling and baking experiments conducted by the milling and baking investigations section and the research laboratory of the Grain Division, Bureau of Agricultural Economics, in cooperation with the Office of Cereal Crops and Diseases, and also by State agricultural experiment stations and by commercial mills.

WHERE HARD RED SPRING WHEATS ARE ADAPTED

Hard red spring wheats are best adapted to the northern and colder regions of the United States. In much of the principal producing area, which includes four States—North Dakota, Montana, South Dakota, and Minnesota—the winters are too cold for the profitable production of winter wheat.

Wherever the winters are not too severe, winter or fall-sown wheat usually is more productive than spring wheat. This is due chiefly to the earlier maturity of winter wheat, which partly enables it to escape hot weather, drought, and diseases, but it is due in part also to the longer growing period of the winter wheat. Spring wheat, therefore, is adapted chiefly to the northern regions where winter wheat is not successfully grown or where it supplements the growing of winter wheat. In northern areas, where both winter

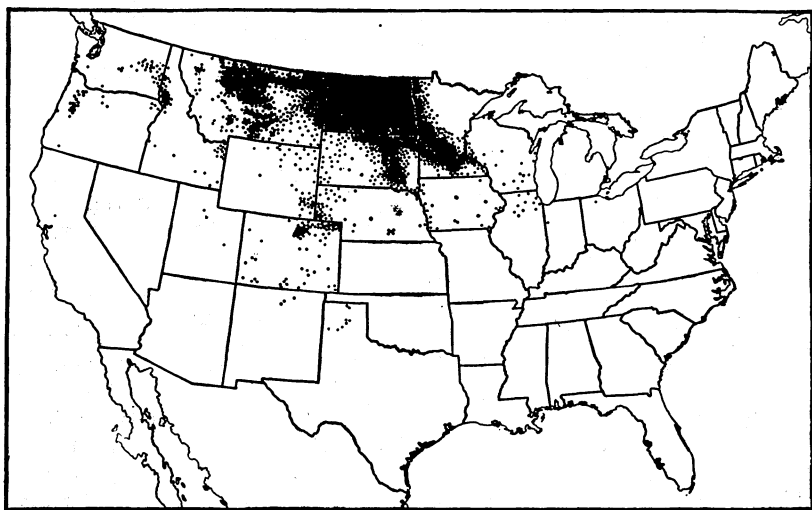


FIGURE 1.—Outline map of the United States, showing where hard red spring wheat was grown in 1924. Each dot represents 2,000 acres or fraction thereof per county. Estimated area, 11,396,140 acres

and spring wheat can be successfully grown, the growing of both affords a better distribution of labor and lessens the seasonal risk. Spring wheat sometimes is sown in the northern areas on land where the fall-sown wheat has winterkilled.

In the Corn Belt winter wheat is more productive than spring wheat, but certain hard red spring varieties are much more productive than any other classes of spring wheat. Hard red spring wheat is not successfully grown south of the Corn Belt.

In the northern part of the intermountain region and in the Pacific Northwest certain varieties of hard spring wheat are fairly successful. In most of these regions, however, the yields of hard red spring wheats are less than those of winter wheats or certain white spring varieties of common and club wheats. In the irrigated sections of these regions hard red spring varieties yield comparatively less than on the dry lands. In California and other

Southwestern States hard red spring wheats are not adapted and are grown only to a slight extent, usually from fall sowing.

The hard red spring is the most productive class of wheat in Minnesota and Wisconsin and in the New England States. In the eastern parts of North Dakota and South Dakota and in the northern Great Plains area the durum wheats yield somewhat more than the best hard red spring varieties, principally because of their greater resistance to drought and to stem rust. In favorable years, however, the leading hard spring varieties yield nearly as well as the durum varieties grown in these districts. The higher price which often prevails for the hard red spring wheat makes the net returns per acre from hard spring wheats nearly as much as from the durum varieties. There usually has been greater domestic demand for hard red spring wheat than for wheat of other classes, because of the high quality of flour it produces.

In general, the hard red spring wheats are best adapted to the areas of more concentrated production, as shown in Figure 1. In the northern Great Plains area, where the durum wheats outyield the hard red spring varieties, the class of wheat grown will largely depend upon the relative market price.

VARIETIES

There are 23 recognized or registered varieties of hard red spring wheat commercially grown in the United States. These are known under about 60 different names. Several additional distinct varieties are grown which have not been recognized by being registered as standard or improved varieties. New varieties are registered, on the basis of performance, under a cooperative agreement between the Bureau of Plant Industry, United States Department of Agriculture, and the American Society of Agronomy.

The varieties of hard red spring wheat differ widely in their yielding ability, rust resistance, earliness, and milling and baking value, as well as in their structure and appearance. Some varieties of similar appearance differ in origin and adaptation. For convenience in describing them the varieties of hard red spring wheat are divided into five groups on the basis of head and chaff characters.

DISTINGUISHING CHARACTERS OF GROUPS OF VARIETIES

Group 1.—Heads beardless; chaff smooth, white or yellow: Marquis, Red Fife, Power, Red Bobs, Kitchener, Ruby, Garnet, Supreme, Marquillo, Huston, Kinney.

Group 2.—Heads beardless; chaff velvety, white or yellow: Haynes Bluestem, Reward.

Group 3.—Heads bearded; chaff smooth, white or yellow: Preston, Kota, Ceres, Reliance, Hope, Java, Progress.

Group 4.—Heads bearded; chaff smooth, brown or red: Ladoga.

Group 5.—Heads bearded; chaff velvety, white or yellow: Prelude, Humpback.

Group 1.—HEADS BEARDLESS; CHAFF SMOOTH, WHITE OR YELLOW

The varieties of Group 1 are the most extensively grown of all the hard red spring wheats. They are somewhat similar in appearance, and most of them are closely related. The heads are beardless and slender. In general, they vary in length from 3 to $3\frac{1}{2}$ or 4

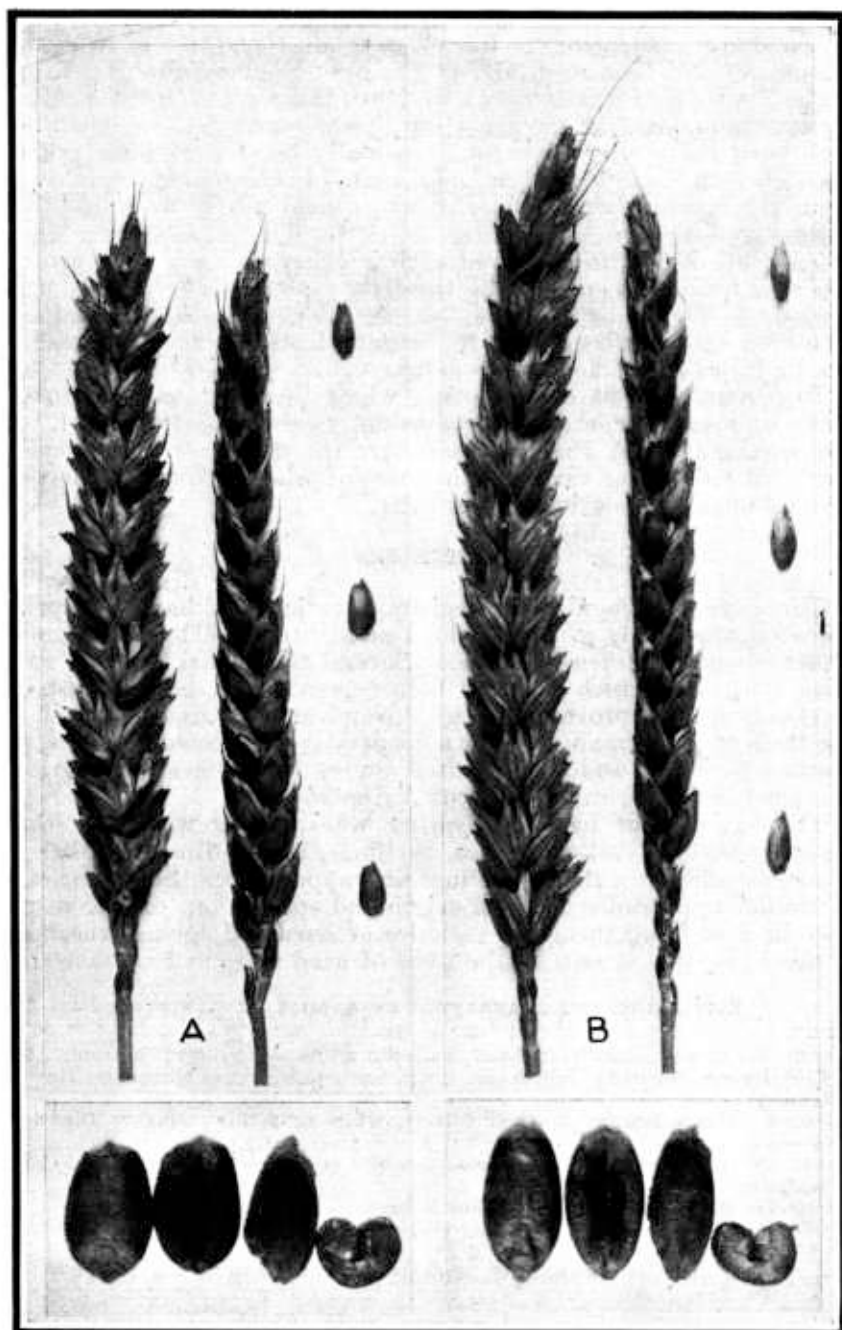


FIGURE 2.—Heads, chaff, and kernels of Marquis (A) and Red Fife (B) wheats. Heads and chaff, natural size; kernels, magnified 3 diameters

inches. The chaff is white and smooth (not velvety or hairy), and the kernels are rather short, small to medium sized, have an angular or irregular appearance, are very hard, and are mostly of a dark-red color. The following registered varieties in this section are not separately considered, as they are no longer commercially grown: Early Red Fife, Ghirka, Glyndon, Rysting, and Wellman. The commercial varieties in this section are described in the following paragraphs.

MARQUIS

Marquis is the most important variety of hard red spring wheat. Although it has been grown in the United States only since 1913, it has been the leading spring-wheat variety since 1919 and is exceeded in acreage by only one variety of winter wheat. Approximately 9,600,000 acres of Marquis wheat were grown in the United States in 1924.

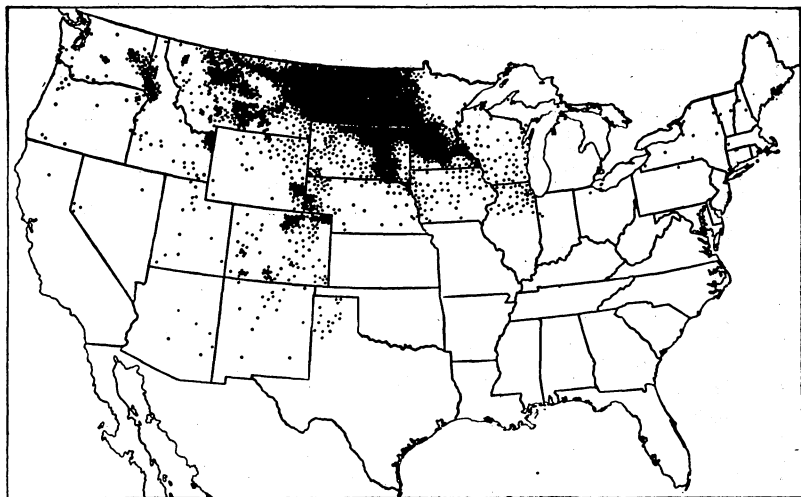


FIGURE 3.—Distribution of Marquis wheat in 1924. Each dot represents 1,000 acres or fraction thereof per county. Estimated area, 9,605,870 acres

The Marquis variety has rather short straw, heads, chaff, and kernels. It matures fairly early, which sometimes enables it partly to escape rust and drought. Like all varieties in this group, it has beardless heads, smooth, white chaff, and red kernels. (Fig. 2, A.) The chaff is rather firm, so the heads are not easily shattered.

Marquis is a selection from a hybrid produced by crossing a hard red wheat from Calcutta, India, and the well-known Red Fife. The cross was made by A. P. Saunders about 1892. The Marquis was selected and named by Charles E. Saunders, Dominion cerealist, and was first grown as a pure line at Ottawa, Canada, in 1904. The commercial growing of Marquis wheat in Canada began in 1909.

The Marquis variety was reported as being grown in 29 States in the United States in 1924. It is the leading variety of wheat in Minnesota, Montana, North Dakota, South Dakota, Wisconsin, and Wyoming. The distribution of Marquis wheat grown in the United States in 1924 is shown in Figure 3.

Marquis has produced high average yields in comparison with other hard red spring varieties in nearly all areas where this class of wheat is grown. In a few localities within the hard red spring wheat region other varieties have yielded as well or slightly better. Marquis wheat is not well suited to growing on poor soil, and it is not resistant to stem rust. It is resistant to leaf rust, however, and to bunt or stinking smut.

Marquis when grown under favorable conditions produces plump kernels containing a high percentage of crude protein and yielding a good percentage of flour.

In the quality of flour for bread making Marquis excels most other varieties of wheat grown in the United States. The bread produced from this wheat has a large expansion and good texture and color.

RED FIFE

The Red Fife variety (known also as Canadian Fife, Fife, Saskatchewan Fife, and Scotch Fife) differs from Marquis in being somewhat taller and later and having longer heads and kernels. Red Fife is shown in Figure 2, B. The original Red Fife wheat is sup-

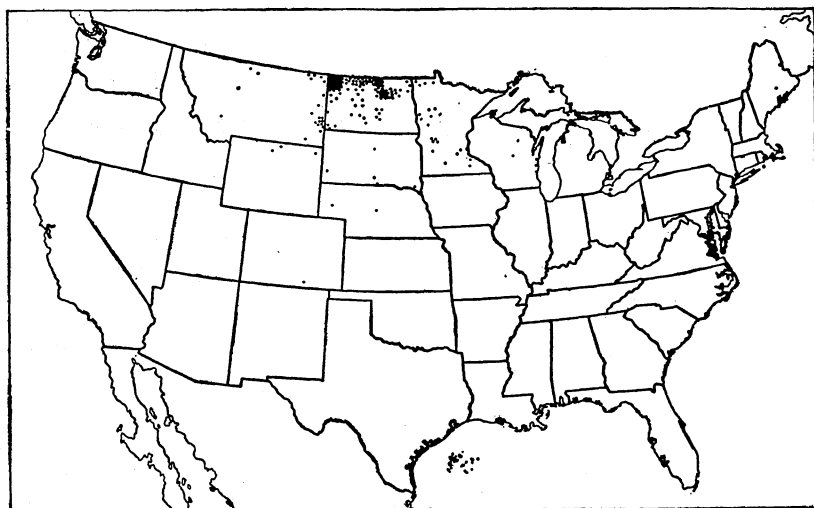


FIGURE 4.—Distribution of Red Fife wheat in 1924. Each dot represents 1,000 acres or fraction thereof per county. Estimated area, 175,008 acres

posed to have come from Poland or Russia by way of Germany and Scotland. About 1842, David Fife, of Otonabee, Ontario, Canada, received a small sample of wheat from a friend in Glasgow, Scotland. The friend had obtained the sample from a shipload of wheat from the German port of Danzig, but supposedly of Russian origin. Mr. Fife sowed the wheat in the spring, but it proved to be a winter wheat. One plant of spring wheat developed, however, which was saved and increased. This was the beginning of the Red Fife wheat, which came to be widely grown in Canada. Samples of wheat identical with Red Fife were received independently in 1904 from Galicia (now a part of Poland) by the Canadian Department of

Agriculture and the United States Department of Agriculture. The cultivation of Red Fife in the United States began in 1860. Prior to the introduction of Marquis it was the leading spring wheat. The Red Fife variety was often grown and distributed under the names of growers. Most of these were only similar pure stocks of this variety, but from them were developed several distinct strains, formerly of considerable importance.

In 1919 the estimated acreage of Red Fife was nearly a million acres, but by 1924 its estimated area had been reduced to 175,000 acres. The distribution of this acreage is shown in Figure 4.

POWER

Power (Power Fife) is nearly identical with Red Fife, except that in the length of the head and kernel it is shorter and more similar to Marquis. The original Power Fife was developed from a single plant found growing in an oat field by James Holes, of Fargo, N. Dak., about 1885. Some of this seed was obtained by J. B. Power, of Power, N. Dak., who increased it and distributed it in large quantities under the name Power Fife. The North Dakota Agricultural Experiment Station, which grew this wheat under the designation of Station No. 66, made some selections from it and distributed one of them from the Williston substation as Power or North Dakota No. 313, which is the origin of most of this variety now grown.

Power is commercially grown only in North Dakota and Montana. The extent of its distribution is not definitely known, owing to its confusion with other Fife wheats.

In varietal experiments Power has produced somewhat higher yields than Red Fife. It has exceeded Marquis in yield only in the northwestern portion of North Dakota and the northeastern portion of Montana. Power has a high percentage of protein, but milling and baking experiments have shown that Power is slightly inferior in milling and baking value to Red Fife and consequently considerably inferior to Marquis.

RED BOBS

Red Bobs usually can be distinguished from other varieties in this group because of the absence of short beards on the tip of the head. (Fig. 5, A.) The heads of practically all beardless wheats have short beards, varying from $\frac{1}{4}$ to 1 inch in length, near the tips of the heads. Most of the heads of Red Bobs, however, do not have these short beards. The variety was not pure in this and other minor respects when it was distributed. Red Bobs matures several days earlier than Marquis. The kernels of the two varieties are almost identical, except that the brush (the hair on the tip of the kernel) of Red Bobs is shorter.

Red Bobs originated from a head found in a field of Bobs, a white wheat, in 1910, by Seager Wheeler, at Rosthern, Saskatchewan, Canada. It probably is the result of a natural field hybrid between Bobs and Marquis. Red Bobs was first distributed in 1918. In 1924 about 15,000 acres were estimated to be grown in the United States. The experiments and trials by farmers have shown that it is very sus-

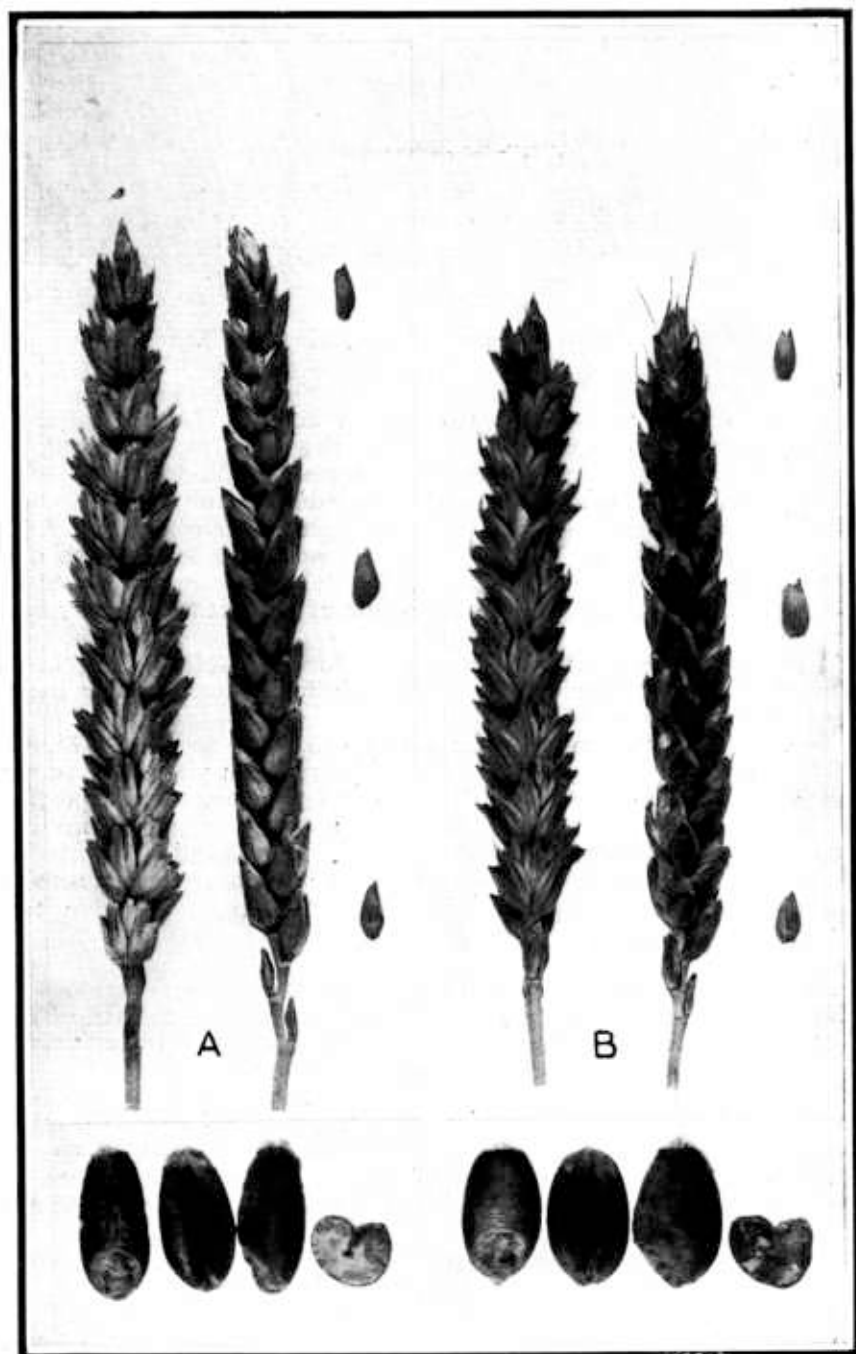


FIGURE 5.—Heads, chaff, and kernels of Red Bobs (A) and Kitchener (B) wheats. Heads and chaff, natural size; kernels, magnified 3 diameters

ceptible to stem rust and adapted only to the northern and drier sections of Montana, where rust does not occur.

In experiments in central and northern Montana Red Bobs has outyielded Marquis. Under conditions of drought Red Bobs usually yields more than Marquis, owing principally to its earlier maturity. Where rust is likely to occur, as in Minnesota and the Dakotas, Red Bobs should not be grown, as usually it yields much less than Marquis.

Red Bobs is a good wheat for milling and baking. In yield of flour it is nearly equal to Marquis when grown under the same conditions. The quality of Marquis flour, however, is superior to that of Red Bobs. The former as a rule has a higher protein content and produces a larger loaf of bread.

KITCHENER

Kitchener differs from Marquis in being slightly later and taller and in having a purple straw and a slightly longer kernel. The chief difference, however, is in the tip of the head of Kitchener, which is square or somewhat clubbed (fig. 5, B), instead of pointed like that of Marquis.

Kitchener originated from a head of wheat found in a field of Marquis in 1911, by Seager Wheeler, at Maple Grove Farm, Rosthern, Saskatchewan, Canada. It was increased by Doctor Wheeler and distributed about four or five years later.

Kitchener is grown to some extent in Canada and the United States. It is scarcely equal to Marquis in any respect, and it is later in maturing and more susceptible to injury by stem rust. In the eastern, more humid, and rust-affected section of the spring-wheat area it has yielded considerably less than Marquis. Only in Montana has it shown any superiority over Marquis in yield, and as it is slightly taller and thus usually easier to harvest, it is preferred by some growers for that section.

In comparative tests Kitchener has proved to be somewhat inferior to Marquis in both milling and baking qualities. It is a better milling and bread-making wheat, however, than the Fife strains.

RUBY

Ruby matures about five days or sometimes a week earlier than Marquis. It also can be distinguished from Marquis by the purple straw at maturity. The grain of the two varieties can scarcely be distinguished.

Ruby was originated by Charles E. Saunders, Dominion cerealist, at the Central Experimental Farm, Ottawa, Canada. It is the result of a cross between Red Fife and a hybrid wheat known as Downy Riga. It was first

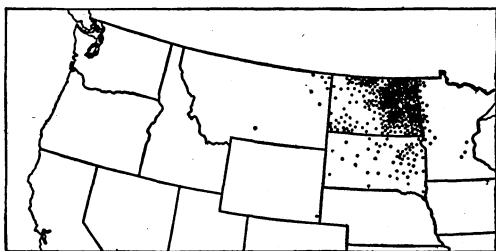


FIGURE 6.—Distribution of Ruby wheat in 1924. Each dot represents 1,000 acres or fraction thereof per county. Estimated area, 329,958 acres

distributed in Canada in 1917 and in the United States in 1921. In 1924 there was estimated to be about 330,000 acres of Ruby grown in the United States. As a rule, however, it has produced lower yields than Marquis, due to its earlier maturity and greater susceptibility to stem rust. The distribution of Ruby wheat in 1924 is shown in Figure 6. Since 1924 its acreage has rapidly decreased.

GARNET

Garnet was produced from a hybrid between Preston and Riga made in 1905 by Charles E. Saunders, then Dominion cerealist of Canada. It was first included in experiments in Canada in 1914. The advantage of Garnet is its early maturity—it is 8 to 10 days earlier than Marquis. In 1926 it was introduced by L. H. Newman, Dominion cerealist, for commercial growing to avoid frost injury. Garnet is now grown in many sections of Canada, and since 1927 it has been grown to a small extent in the United States to meet a limited demand for an early wheat.

In the experiments in North Dakota and Montana, where it is best adapted, Garnet has not yielded so well as Ruby or Marquis. The quality of Garnet also is not so good as that of other early wheats, particularly Reward. The further distribution and growing of Garnet wheat in the United States, therefore, should be discouraged.

SUPREME

Supreme was developed as a selection from Red Bobs by Seager Wheeler at Rosthern, Saskatchewan, Canada. It is uniform in type of head, being completely beardless (fig. 7, A) and similar to most of the types present in Red Bobs. It has a dark-green color of stem and leaf when green and is shorter than some of the types of plant in Red Bobs. It has outyielded Marquis and Red Bobs in Montana, where it is recommended by the experiment station and preferred by many growers. It is four to seven days earlier than Marquis, has stronger stems, and is about equal in milling and baking quality. The crude protein content of Supreme usually is less than that of Marquis, however, due partly to differences in yield. Supreme, like Red Bobs, is susceptible to stem rust and should not be grown in Minnesota and the Dakotas, where rust is likely to occur.

MARQUILLO

Marquillo (fig. 7, B) was developed at the Minnesota Agricultural Experiment Station in cooperative experiments with the Office of Cereal Crops and Diseases, Bureau of Plant Industry. It is the result of a cross made in 1914 between Marquis and Iumillo durum. The selection was made in 1918, and the variety has been grown in experiments in Minnesota and other States since 1921. The advantages of Marquillo are its resistance to stem rust and its strong straw. It has outyielded Marquis in Minnesota and is best adapted in that State and to the heavier soils where rust and lodging are serious factors. It was distributed in 1929 for commercial growing by the Minnesota Agricultural Experiment Station. Its adaptation will probably be limited to the valley sections of Minnesota and eastern

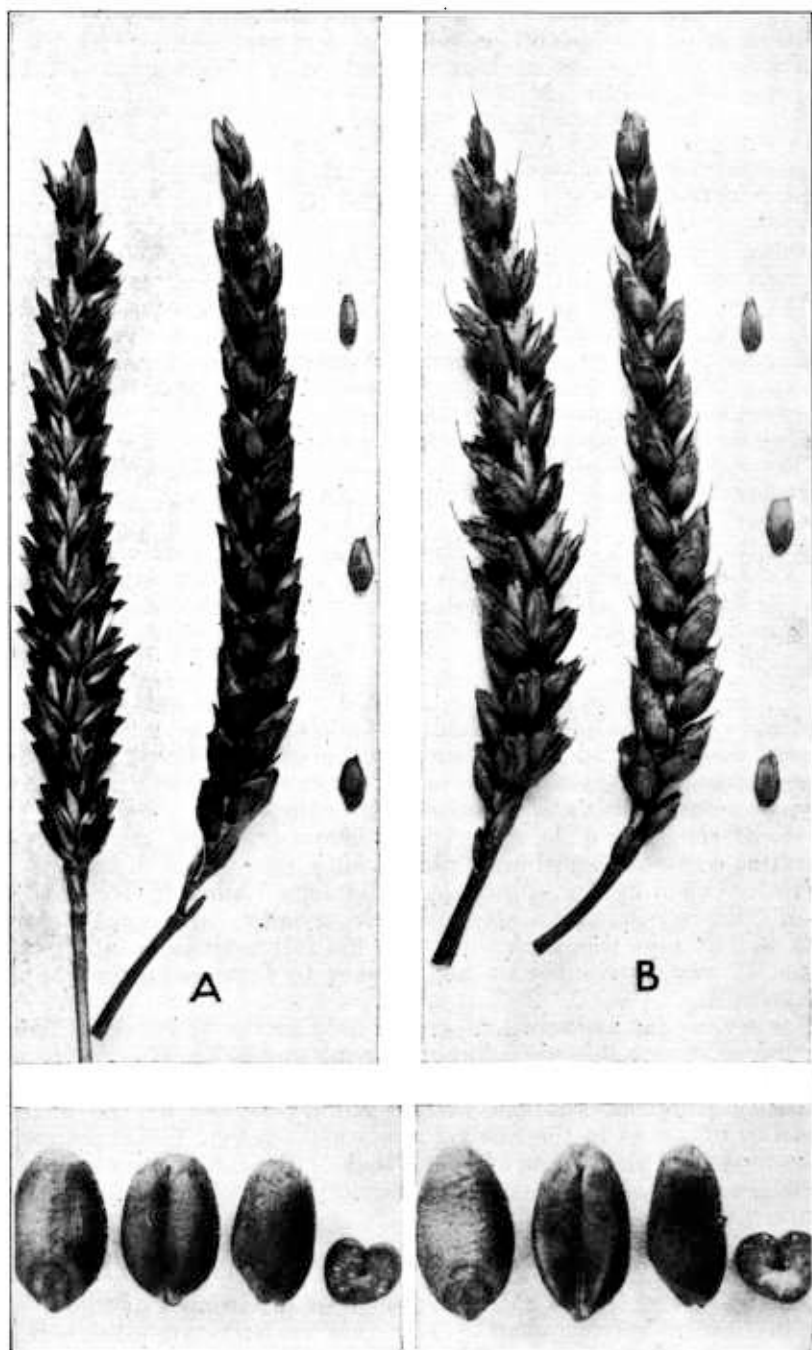


FIGURE 7.—Heads, chaff, and kernels of Supreme (A) and Marquillo (B) wheats. Heads and chaff, natural size; kernels, magnified 3 diameters

North Dakota. In other sections it does not yield so well as other varieties. The protein content of Marquillo grain is high in comparison with that of other varieties, and its milling and baking qualities are good except that it produces a yellowish flour which requires bleaching.

HUSTON

Huston (known also as Bulgarian, Early Wonder, Grass, Little Red, Ninety-Day, Red Springs, and Swamp) differs from most other varieties included in Group 1 in having small heads and rather soft kernels. The straws show a faint tinge of purple at maturity. The kernels show a characteristic central pit or opening in the crease.

Huston was obtained by a Mr. Belshaw in 1876 from the Centennial Exposition at Philadelphia, Pa., where it was on exhibition as Bulgarian Red Spring. It was introduced into the vicinity of Eugene, Oreg. After increasing the seed the crop was given to a Mr. Huston, who grew and distributed the variety.

Huston now is generally grown in western Oregon, but apparently it has not been successful elsewhere. None of it is grown in the northern hard spring wheat region. This variety succeeds best on the foothill lands in the Willamette Valley of Oregon and is the best spring wheat for that district. The milling and baking value of Huston is inferior to that of Marquis and to most other hard spring varieties. It sometimes is grown from fall seeding and sold and graded as soft red winter wheat.

KINNEY

Kinney (known also as Noah Island, Odessa, and Surprise) is classed as a hard red spring wheat, although, like Huston, it differs widely from the varieties previously discussed. It is a late wheat, having square heads and a rather soft, wide kernel. The stems and leaves of this variety have a distinct bloom or white waxy covering (such as occurs on sorghums, plums, etc.) just before ripening.

Kinney was introduced into the Willamette Valley of Oregon from France during the late sixties or early seventies by Albert Kinney, who at that time was associated with his father in the milling business. It was distributed by Mr. Kinney to farmers in the vicinity of the mill.

Kinney, as far as known, is grown only in the Willamette Valley of Oregon, where it is sown in both spring and fall. It is not grown in the northern hard spring wheat region, and because of its late maturity it is not adapted there. Kinney is one of the leading varieties of wheat in the district where it is grown, but experiments have shown its yield to be less than that of Huston and several other varieties. Outside of this humid section of Oregon Kinney is not adapted.

Group 2.—HEADS BEARDLESS; CHAFF VELVETY, WHITE OR YELLOW

The wheats of Group 2 differ from those in Group 1 of this bulletin in having velvety chaff. Only two varieties are discussed in this group. They differ widely in their time of maturity. Dakota or Select Bluestem, N. Dak. No. 316, is not described, as it is no longer commercially grown.

HAYNES BLUESTEM

The name Haynes Bluestem is now applied to the original Bluestem as well as to the selected strain known as Haynes Bluestem. Other names applied to the variety are Bolton Bluestem, Marvel Bluestem, Minnesota No. 169, and Velvet Bluestem. This variety has large beardless heads, velvety white chaff, and rounded hard red kernels. It shatters easily and is of late maturity. (Fig. 8.)

Haynes Bluestem was selected from the bulk Bluestem variety in 1883 by L. H. Haynes, of Fargo, N. Dak. This wheat was first distributed about 1892 and soon became widely grown in Minnesota and the Dakotas. Selections from this wheat made at the Minnesota Agricultural Experiment Station were increased and distributed by that station during the late nineties as Minnesota No. 169 or Haynes Pedigreed Bluestem.

Haynes Bluestem, under one or another of its names, is now grown to only a limited extent throughout the northern spring-wheat region. About 133,000 acres of this variety were grown in 1924. (Fig. 9.) It was formerly extensively grown and considered a high-yielding variety in Minnesota and the eastern Dakotas. In the Great Plains area it always has been a poor yielder, owing to its late maturity and consequent injury from summer drought. Since the introduction of Marquis, the acreage of Haynes Bluestem has rapidly decreased.

Since 1915 stem rust has caused serious injury to

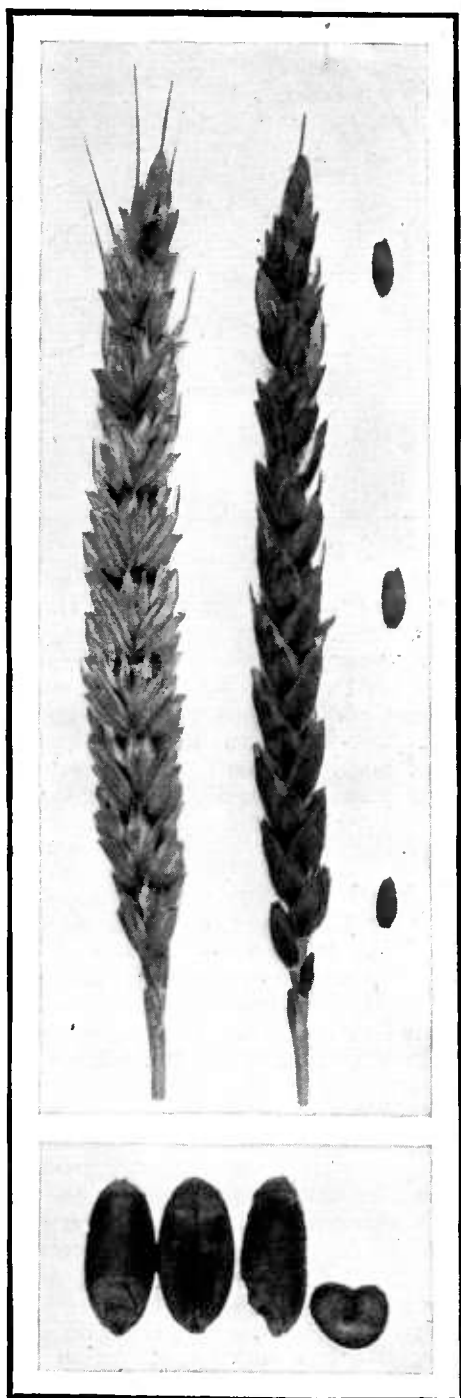


FIGURE 8.—Heads, chaff, and kernels of Haynes Bluestem wheat. Heads and chaff, natural size; kernels, magnified 3 diameters

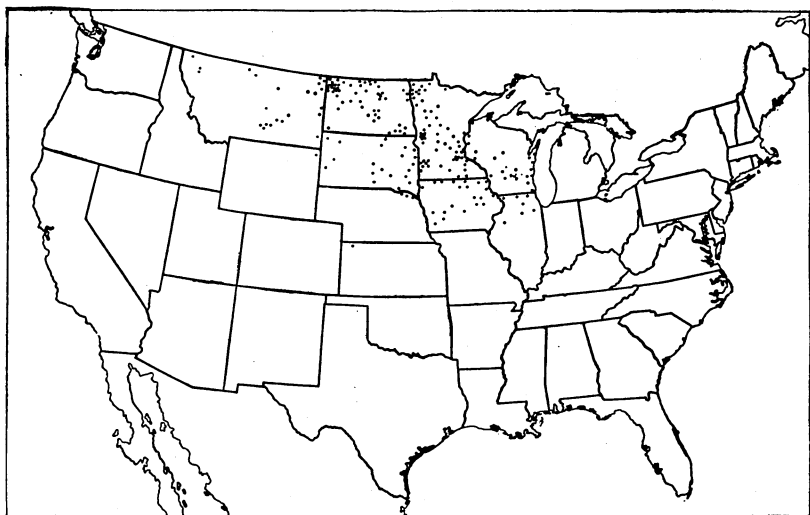


FIGURE 9.—Distribution of Haynes Bluestem wheat in 1924. Each dot represents 1,000 acres or fraction thereof per county. Estimated area, 133,031 acres

Haynes Bluestem in some sections of the northern spring-wheat region nearly every year. During recent years the variety has given comparatively low yields, and its acreage has continued to be reduced since 1924 until it has nearly disappeared from cultivation. Under present conditions it is not advisable to grow this wheat.

Haynes Bluestem has long been considered a good milling and bread-making wheat. Experiments have shown, however, that it is slightly inferior to Marquis for these purposes.

REWARD

Reward (fig. 10) was produced from a Marquis×Prelude cross made in 1911 by Charles E. Saunders. It has been tested at the Dominion experiment farms and stations throughout Canada since 1921. It was distributed in 1927 for commercial growing in Canada by L. H. Newman, Dominion cerealist. It was first grown to a limited extent in the United States in 1928.

The advantages of Reward are its early maturity and its large plump kernels of exceptionally high quality. It is now recommended for growing in Canada and is preferred to Garnet because of its better quality, in spite of slightly lower yields. Its early maturity enables it to escape frost injury in northern Canada, and it was for this purpose that it was developed. In the United States early maturity usually results in lower yields. While the yields of Reward are comparatively low in comparison with the best hard red spring varieties in the United States, it appears probable that it may meet the demand for an early, high-quality wheat for the drier marginal sections. Reward also has shown promise, because of its early maturity and stiff straw, on heavy valley soils where stem rust and lodging are serious factors in production. The payment of premiums for high-protein wheat also may result in the growing of

Reward wheat in areas where these premiums would more than compensate for the reduction in yields. At the present time Reward is known to have the highest protein content of any of the commercial varieties of hard red spring wheat grown in the United States.

Group 3.—HEADS BEARDED; CHAFF SMOOTH, WHITE OR YELLOW

Group 3 includes several distinct varieties. Most of them mature early or in midseason. The kernels vary, but in general are rather plump, heavy in weight per bushel, of dull-red color, and of less angular appearance than the wheats included in Group 1. In texture they vary from almost soft to very hard and in size from small or short to very large or long. The following registered varieties in this group are not separately considered, as they are no longer commercially important: Champlain, Chul, Converse, Dixon, Erivan, Fretes, and Pioneer. One of the most widely grown varieties in this group is Preston, which commonly is called Velvet Chaff.

PRESTON

Preston (Velvet Chaff, known also as Bearded Fife, Blue Ribbon, Climax, Golden Drop, Johnson, Johnson's Early Fife, Minnesota No. 188, and Red Fife) has bearded, tapering heads, about $3\frac{1}{2}$ to 4 inches long, and mid-sized hard red kernels. The kernel can be distinguished by the dull-red color and the rather narrow V-shaped crease. Preston matures in about the same length of time as Red Fife, being a few days later than Marquis. A spike, glumes, and kernels of Preston are shown in Figure 11, A.

Preston was developed from a cross between Ladoga and Red Fife



FIGURE 10.—Heads, chaff, and kernels of Reward wheat. Heads and chaff, natural size; kernels, magnified 3 diameters

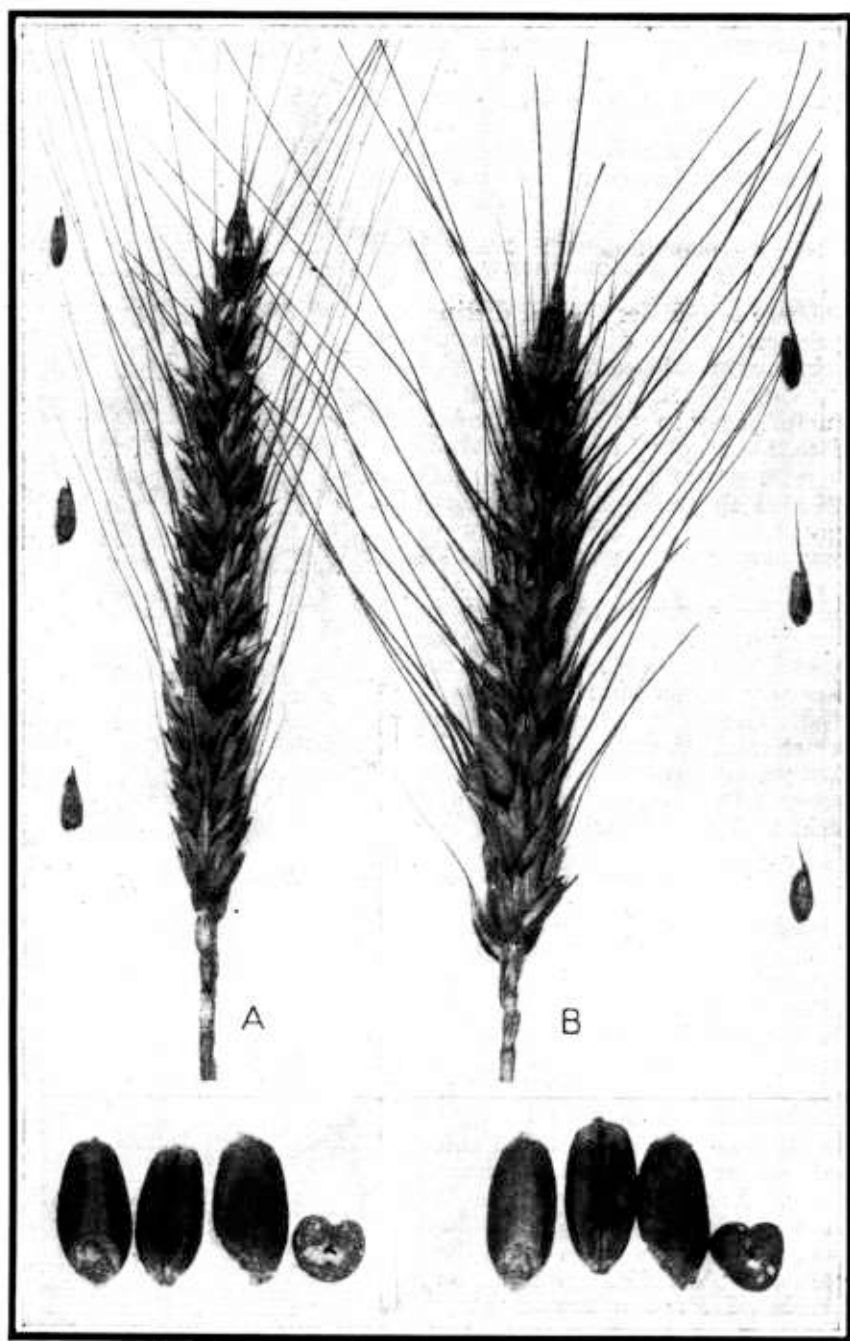


FIGURE 11.—Heads, chaff and kernels of Preston (A) and Kota (B) wheats. Heads and chaff, natural size; kernels, magnified 3 diameters

made by William Saunders at the Central Experimental Farm, Ottawa, Canada, in 1888. After being selected, this wheat was distributed in Canada and also sent to the Minnesota Agricultural Experiment Station in 1896, from which station it was later distributed to farmers of that State as Minnesota No. 188. Other similar wheats, called Johnson and Golden Drop, which can not be distinguished from Preston, were grown in the United States prior to this introduction of Preston. These wheats, however, were not pure, as they contained other types, and the name Johnson had sometimes been used for the Java variety. Java also contained mixtures similar to Preston. The exact history of the spring wheat commonly called "Velvet Chaff" in this country is somewhat uncertain, therefore, although it is identical with the Preston wheat of Canada. In Wisconsin a selection of this wheat is grown under the name of Blue Ribbon.

Preston (or so-called "Velvet Chaff") was formerly grown throughout the northern spring-wheat region, and especially in the Red River and Minnesota River Valleys. Its distribution in 1924 is shown in Figure 12. It was estimated that 2,245,200 acres were grown in 1919 but only 392,176 acres in 1924. Since 1924 its acreage has continued to decrease. In the Red River Valley of Minnesota and North Dakota and in the Minnesota River Valley of Minnesota Preston has yielded nearly as high as Marquis and occasionally higher than that variety. In general, however, Marquis has given higher yields. Preston is very susceptible to stem rust, and it is largely for this reason that its acreage has rapidly declined.

Preston produces a plump kernel which under average conditions weighs about $1\frac{1}{2}$ pounds per bushel more than Marquis grown in the same locality. This is not true under very favorable conditions, however. Nevertheless, the heavier bushel weight frequently results in a higher market grade for Preston. Owing partly to its high bushel weight Preston usually produces a larger percentage of flour than Marquis. The variety, however, is inferior to Marquis in protein content and in baking quality, though experiments show it to be about equal to Red Fife and Haynes Bluestem in these characters.

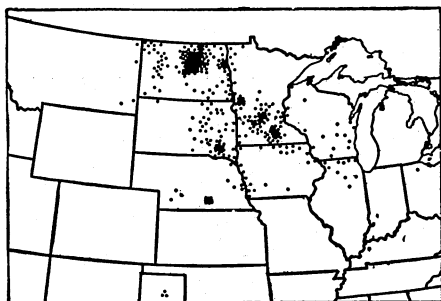


FIGURE 12.—Distribution of Preston wheat in 1924. Each dot represents 1,000 acres or fraction thereof per county. Estimated area, 392,176 acres

KOTA

Kota is resistant to the forms of black stem rust that predominate in the northern spring-wheat region. It is susceptible, however, to the less-damaging orange leaf rust and to both stinking smut and loose smut. Aside from its resistance to stem rust Kota differs from Preston in having longer beaks and a more elevated shoulder on its outer glumes. The beaks of Kota average about one-half inch long,

while those of Preston average only about one-eighth inch in length. Kota has a slightly weaker straw and is more easily lodged than Preston, and the kernels are longer, harder, and more angular. A spike, glumes, and kernels of Kota are shown in Figure 11, B.

The original seed was obtained in Russia in 1903 by H. L. Bolley, of the North Dakota Agricultural College, while making a study of the flax industry of Europe for the United States Department of Agriculture. In the years immediately following its introduction this wheat was not known to have any special merit. After the rust epidemic of 1916, mixtures of it in Monad durum wheat were separated and found to be resistant to some forms of stem rust and to have good agronomic and milling values. The variety was named Kota by L. R. Waldron, of the North Dakota Agricultural Experiment Station, and J. A. Clark, of the United States Department of Agriculture. The commercial production of Kota was begun in 1919. Its acreage was estimated at 471,313 acres in 1924, and its distribution is shown in Figure 13. Since 1924 the acreage of Kota has been reduced, owing largely to its susceptibility to smut. The experiments with Kota, because of its resistance to stem rust, have shown

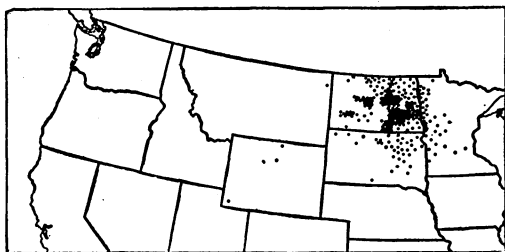


FIGURE 13.—Distribution of Kota wheat in 1924. Each dot represents 1,000 acres or fraction thereof per county. Estimated area, 471,313 acres

that it is able to yield well under rust conditions. Under favorable conditions Marquis and other varieties of hard spring wheat have out-yielded Kota.

Kota is a good milling and bread-making wheat. It has a high percentage of protein and high flour yield and is superior to other varieties in water absorption.

The acreage of Kota should be replaced with Ceres, which was developed from it by breeding. Ceres has all of the advantages of Kota and consistently outyields it.

CERES

Ceres was developed at the North Dakota Agricultural Experiment Station by L. R. Waldron, from a hybrid between Marquis and Kota, made in 1918. The superior characters of Ceres (fig. 14, A) are resistance to stem rust, early maturity, good strength of straw, high yield, and quality. The disadvantages are its susceptibility to both bunt, or stinking smut, and loose smut. Ceres has been grown in experiments since 1923 and commercially since 1926. Approximately a half million acres of the variety were grown in 1929. It is best adapted to the eastern Dakotas and Minnesota, where stem rust occurs. It gives promise, however, of being more widely adapted than any variety developed since Marquis. In field experiments it has consistently outyielded Marquis in all sections of the spring-wheat area of the United States. This increased yield obtained from Ceres also has been accompanied by an increase in quality. In milling and baking experiments Ceres exceeds or equals Marquis in test weight

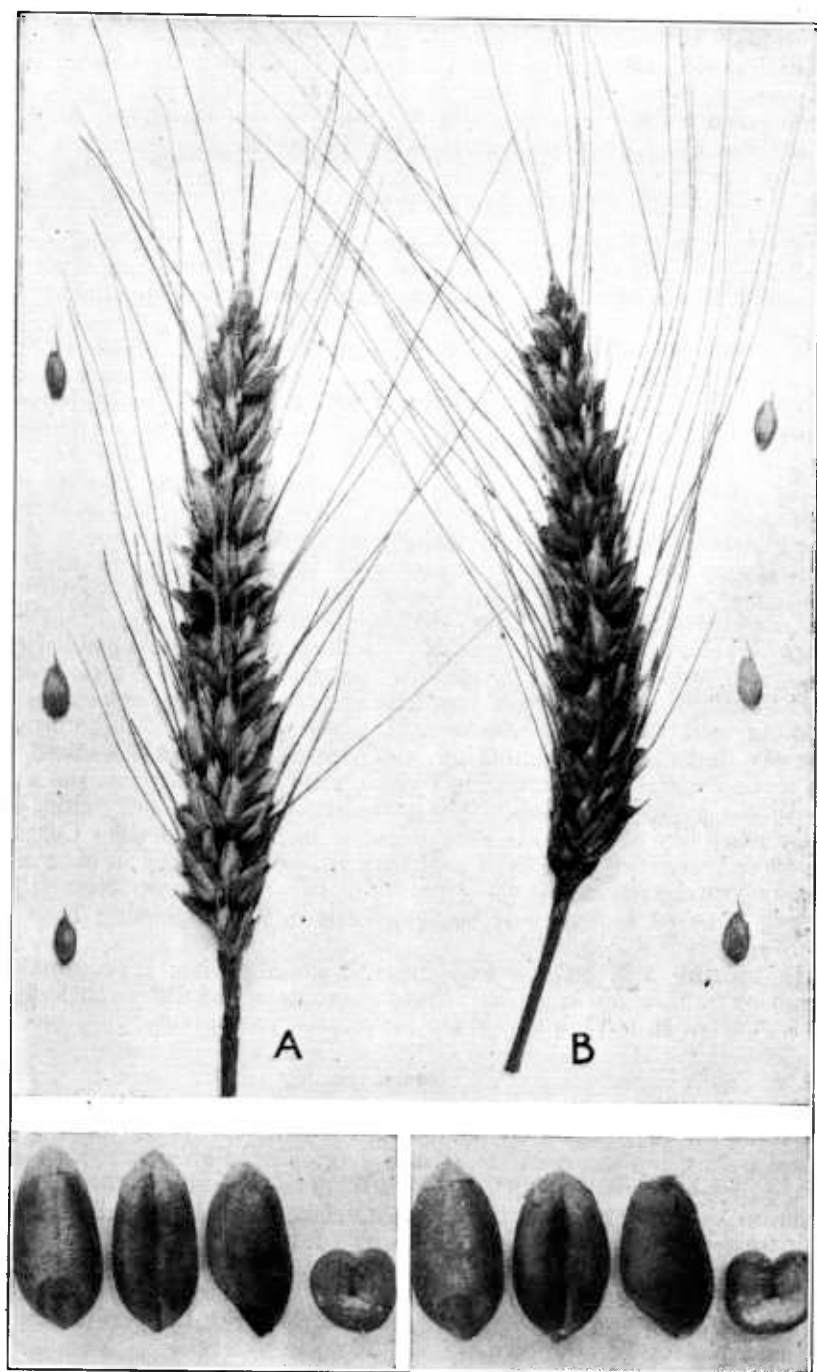


FIGURE 14.—Heads, chaff, and kernels of Ceres (A) and Reliance (B) wheats. Heads and chaff, natural size; kernels, magnified 3 diameters

per bushel, crude-protein content, flour yield, water absorption, volume of loaf, and texture and color of crumb.

The rapid increase in the commercial growing of Ceres wheat appears justified from experimental results. It is now grown in preference to Kota, Ruby, and Preston, and is replacing Marquis and varieties of durum wheat in certain sections.

RELiance

Reliance (fig. 14, B) was developed by the Office of Cereal Crops and Diseases, Bureau of Plant Industry, in cooperation with the Oregon, Montana, North Dakota, and Minnesota experiment stations. It is the result of a Kanred \times Marquis cross made in 1917 at the Sherman County Branch Station, Moro, Oreg. The superior characters of Reliance are plant vigor, a seedling resistance to certain forms of stem rust, strong straw, and a capacity for high yields under favorable conditions. Reliance is not resistant to stem rust in the mature plant stage and therefore is not adapted for growing in the rust area. In experiments in western North Dakota and Montana, however, where stem rust has not been an important factor, Reliance has outyielded Marquis, Ceres, and Supreme.

Reliance has been grown in plot experiments at stations in Montana, North Dakota, and Minnesota since 1924 and was distributed for commercial growing from the Northern Great Plains Field Station, Mandan, N. Dak., in 1926. Because of its susceptibility to stem rust it has not been successfully grown in eastern North Dakota and South Dakota where it was first distributed. In western North Dakota and Montana, however, it gives promise of becoming a variety desired for "combining." There is a growing demand for an awned wheat for combining by the windrow method, as the awns facilitate a clean pick-up. The stronger straw, larger yields, and later maturity of Reliance may cause it to be preferred to Ceres as an awned variety. The later maturity is beneficial only in extending the harvesting period, as the growing of two or more varieties differing in time of maturity is being practiced for combining by some growers.

In milling and baking experiments Reliance has been equal or superior to Marquis in all important characters and differs little from Ceres except in having a slightly lower protein content.

HOPE

Hope was developed by E. S. McFadden, at Webster, S. Dak., from a selection made in 1923 from a cross of Yaroslav emmer and Marquis wheat made in 1915. The advantages of Hope wheat are its immunity in the mature plant stage from the forms of black-stem rust present in the spring-wheat area of the United States, its resistance to leaf rust, and to both the bunt or stinking smut and the loose smut of wheat. It also is resistant to shattering and to drought. It is susceptible to the black-chaff disease, however, the seriousness of which is as yet little known.

Hope wheat (fig. 15, A) has been in experiments since 1927, in which year it also was distributed for commercial growing. It has

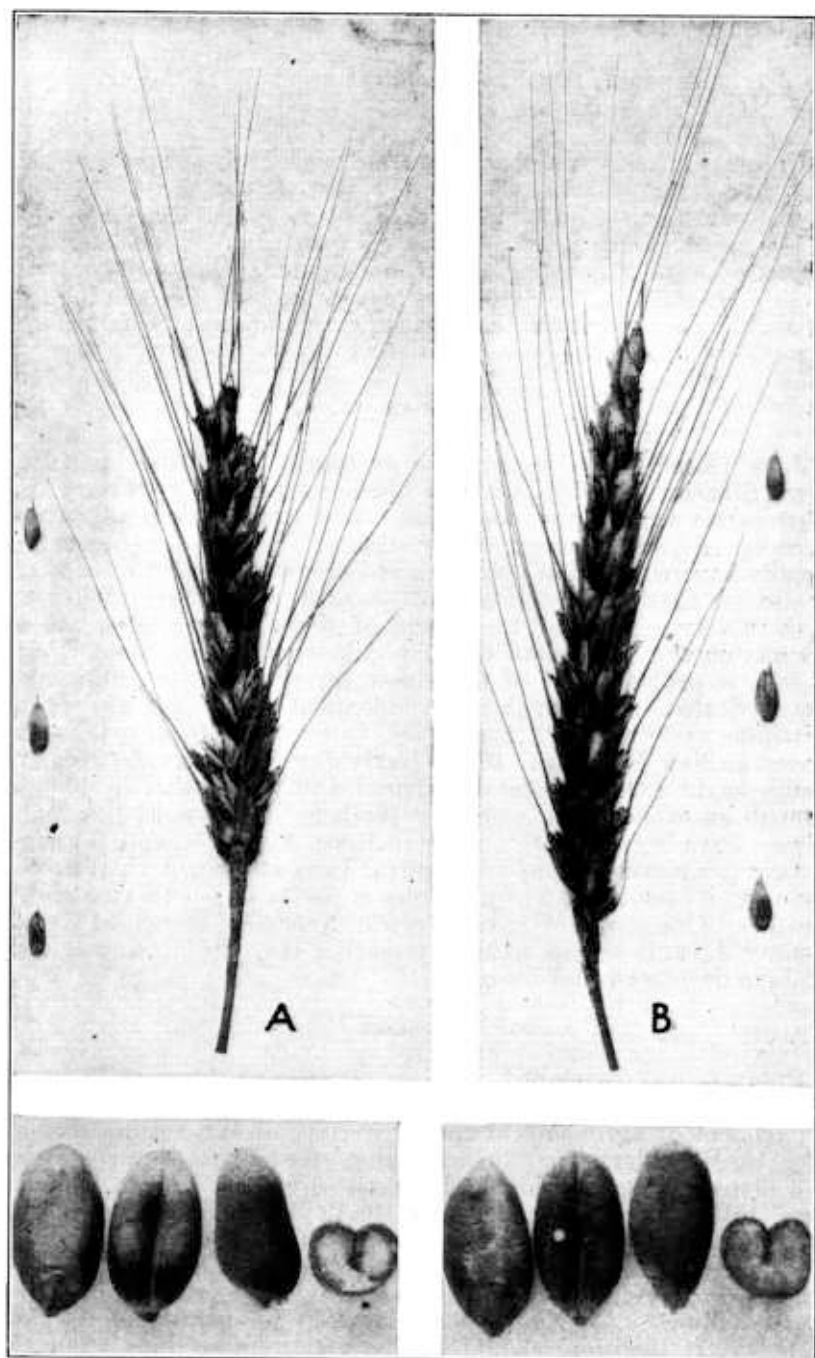


FIGURE 15.—Heads, chaff, and kernels of Hope (A) and Progress (B) wheats. Heads and chaff, natural size; kernels, magnified 3 diameters

yielded more than Marquis but less than Ceres in limited experiments in North Dakota. It appears to be best adapted to the rust area of North Dakota and South Dakota and to unfavorable conditions of drought. It does not have the capacity for large yields under favorable conditions and has yielded considerably less than Marquis in Montana.

In limited milling and baking experiments Hope differs from Marquis in having a comparatively low test weight per bushel but a high protein content and flour yield. Its yield of bran and shorts is low, which contributes to its high flour yield in spite of a low bushel weight. The water absorption, volume, and weight of loaf of Hope is higher, but its color and texture of loaf is lower than that of Marquis. Altogether, the first experimental results indicate that the quality of Hope should be satisfactory.

JAVA

Java (Early Java, known also as Black Tea, China Tea, Early Iowa, Siberian, Swedish, and Tea Leaf) is a mixture of several kinds. Within this variety are found both white and brown chaff, soft and hard kernels, and other minor variations. The heads are bearded and usually have white chaff and semihard kernels. As a rule the kernels are softer than those of Preston. Java is a few days earlier than that variety. Most of the heads of Java have longer "beaks" (points on the outer chaff of each spikelet, or mesh) than Preston.

Java is probably one of the oldest spring varieties grown in the United States. Siberian (a variety identical with Java) was reported grown as early as 1837. China Tea (identical with Java) has been grown in New York since 1845. Early Java was first reported from Nebraska in 1899. It was advertised and distributed in 1900 and later as an early spring wheat by Wallaces' Farmer, of Des Moines, Iowa. Java is grown principally in Iowa, Nebraska, and Wisconsin.

Java has given fair yields in central Iowa and northern Wisconsin, owing to its earliness, which enables it partly to escape rust and hot weather. One strain of Java grown in Nebraska, known as Kearney County Java, is a week to 10 days earlier than Progress, a selection of Java developed in Wisconsin.

PROGRESS

Progress was developed from a selection of Java made in 1916 by E. J. Delwiche at the Marshfield branch station operated by the department of agronomy of the University of Wisconsin. Progress (fig. 15, B) differs from Java in being resistant to stem rust, and it is a better yielder. It has been grown in experiments in Wisconsin since 1917 and commercially since 1921. It outyields Marquis and other spring wheats under Wisconsin conditions but has not shown to as good advantage in other sections. Progress has a high percentage of protein, but usually produces a low volume of loaf in bread-making experiments, indicating that the quality of its gluten is poor. It therefore should not be grown in sections other than Wisconsin, where it is best adapted.

Group 4.—HEADS BEARDED; CHAFF SMOOTH, BROWN OR RED

Only one variety of Group 4, Ladoga, is commercially grown in the United States. The Huron, Laramie, Norka, and Webster varieties are no longer grown commercially.

LADOGA

Ladoga (known also as Spring Turkey and Bastard) as commercially grown contains mixtures of several forms. In general Ladoga is slightly earlier than Preston and is susceptible to stem rust. The kernel of Ladoga, although somewhat smaller, resembles that of Turkey, a hard red winter wheat. Ladoga, also being bearded like Turkey, is sometimes known as Spring Turkey.

Ladoga wheat was introduced into Canada about 1888 from Russia, where it was grown in latitude 60°, near Lake Ladoga, north of Leningrad. Because of its earliness it was distributed by the Canadian Department of Agriculture in northwestern Canada during the next five years, but by 1893 it had been found to be of poor milling quality, and its further production was discouraged. It is not known when or by whom this variety was introduced into the United States, but it is sparingly grown on both dry and irrigated lands, principally in Colorado and Montana. It is not an important variety in any State, but is common in mixture with Marquis.

The yields from Ladoga in comparative experiments have been lower than those from nearly all other varieties of hard red spring wheat. It was early discovered that Ladoga was inferior to Red Fife in milling and baking qualities. This wheat, therefore, should be entirely replaced by other varieties.

Group 5.—HEADS BEARDED; CHAFF VELVETY, WHITE OR YELLOW

Group 5 includes two rather unimportant varieties which differ widely in characters and in adaptation.

PRELUDE

Prelude (Wisconsin Wonder) is extremely early, maturing from 7 to 10 days earlier than Marquis; it has short stems, heads, and kernels. The beards also are short and dark brown or black when ripe, and the chaff is covered with short fine white hairs. (Fig. 16, A.) The heads shatter very easily when fully ripe, so the variety must be harvested while still somewhat green. The kernels of Prelude are of a dark-red color and have a very short brush.

Prelude was originated by Charles E. Saunders, cerealist of the Dominion Department of Agriculture, at the Central Experimental Farm, Ottawa, Canada. It resulted from a cross made in 1903 between the Fraser and Gehun varieties. Fraser also was of hybrid origin and was produced at Ottawa, whereas Gehun was introduced from India. Prelude was first distributed in Canada in 1913. It was introduced into the United States by the United States Department of Agriculture for experimental purposes in 1915. About 1910

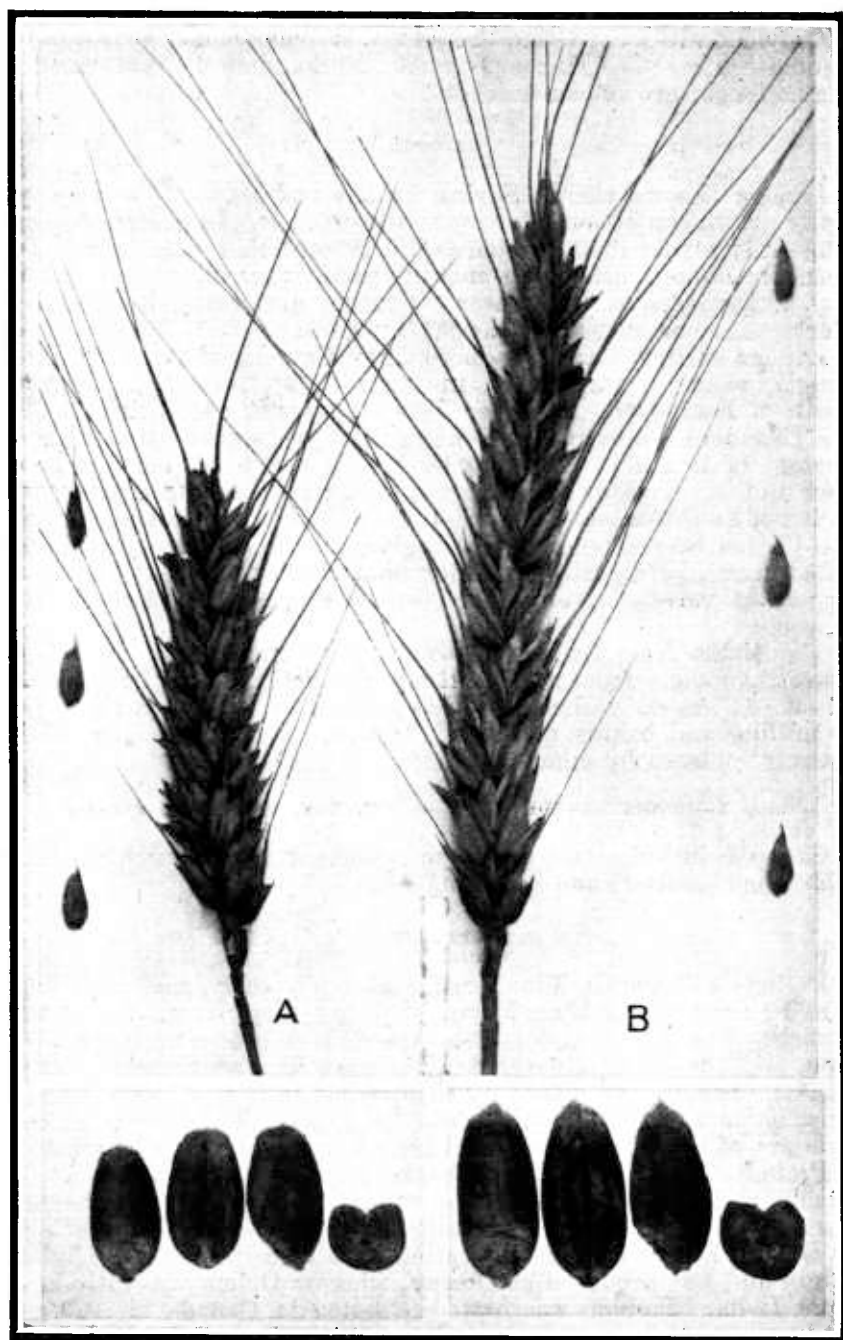


FIGURE 16.—Heads, chaff, and kernels of Prelude (A) and Humpback (B) wheats. Heads and chaff, natural size; kernels, magnified 3 diameters

H. E. Krueger, of Beaver Dam, Wis., found a plant of Prelude in a field of Marquis. This he increased and distributed as Wisconsin Wonder, and Prelude now is grown to a limited extent under that name in Wisconsin and Minnesota.

Prelude is best adapted to the northern wheat sections of Canada, for which it was originated because of the very short growing season; but in the United States it is too early to produce maximum yields. Under favorable conditions this wheat usually is outyielded from 10 to 30 per cent by Marquis or other varieties. Its earliness sometimes has enabled it to escape summer drought or hot winds and give fairly good yields in seasons which were very unfavorable for later-maturing varieties. In a few dry seasons, in the Great Plains section of Colorado and Nebraska, Prelude has outyielded all other hard red spring wheat varieties. On the average, however, even in these sections, Prelude is outyielded by Marquis and several other varieties. These sections also are better adapted to hard winter and durum spring wheats than to hard red spring varieties. Prelude is not now and should not become an important spring wheat in the United States, on account of its low average yield, its susceptibility to smut, and its easy shattering. Prelude is equal or superior to Marquis in milling and baking qualities, and this high quality has been transmitted to Reward, which is a much more promising variety.

HUMPBACK

Humpback (known also as Bearded Bluestem and World Beater) has bearded, velvety, white-chaffed heads like Prelude, but the heads are long and wide and the plant is late in maturing. (Fig. 16, B.) The kernels are softer than those of most of the hard red spring varieties and are large and pale red, with a long and large brush and a shape commonly described as humped. The crease of the grain has a deep pit or opening in the middle.

Humpback originated from field selections made by J. P. Berglund, a farmer living near Kensington, Minn. The original head probably was the result of a natural field hybrid. Two strains were developed. The first, which was distributed about 1905, became known as Humpback, and the second, which was distributed a few years later but which differs in having smooth chaff, as Dixon. Humpback is not grown so extensively now as it was a few years ago.

In all comparative experiments Humpback has given low yields. It matures too late to avoid rust and drought and is not a high-yielding wheat under favorable conditions. It also has inferior milling and baking qualities, and because of this it brings a low price on the market. The growing of Humpback, therefore, should be discontinued.

ADDITIONAL VARIETIES

There are several other distinct hard red spring varieties commercially grown which have not been extensively tested at experiment stations or registered on the basis of their performance. Very little is known, therefore, regarding these varieties, and none of them are recommended for extensive growing. Principal among these are Sea Island, Montana King, Early Triumph, Renfrew, Marvel, Whitman, and Vermillion.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

May 1, 1930

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